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him from the rest of his nation. We would rather say that through him a new spirit was arising in German astronomy from within, raising, broadening and humanizing its outlook; and we are confident that he has left behind an influence which will enlarge and revivify the old traditions.

# PLANETARY PHENOMENA FOR JANUARY AND FEBRUARY, 1917.

By MALCOLM McNEILL.

## PHASES OF THE MOON, PACIFIC TIME.

Full Moon...	Jan. 7th, 11 <sup>h</sup> 42 <sup>m</sup> P.M.	Full Moon...	Feb. 6th, 7 <sup>h</sup> 28 <sup>m</sup> P.M.
Last Quarter.	" 16th, 3 42 A.M.	Last Quarter "	14th, 5 53 P.M.
New Moon...	" 22d, 11 40 P.M.	New Moon.. "	21st, 10 9 A.M.
First Quarter.	" 29th, 5 1 P.M.	First Quarter "	28th, 8 44 A.M.

The year 1917 will have the maximum number of *eclipses*, seven. Of these, three are of the Moon and four of the Sun. There will not be another year with seven eclipses until 1935, and then there will be two of the Moon and five of the Sun. The last previous occurrence of this latter phenomenon was in 1823. Three lunar eclipses occurred in 1908, but in that year there were only three solar, making a total of six. The average number of eclipses per year is four or five, but the number may be as low as two. In this case, which happened in 1904, both of the eclipses were solar and both central.

There will be two eclipses during January; the first is a *total eclipse of the Moon* on the night of January 7-8, and will be visible thruout the United States. The circumstances of the eclipse are as follows, Pacific Time:

Moon enters shadow	Jan. 7th, 9 <sup>h</sup> 50 <sup>m</sup> P. M.
Total eclipse begins	" 7th, 11 0 P. M.
Middle of the eclipse	" 7th, 11 45 P. M.
Total eclipse ends	" 8th, 12 29 A. M.
Moon leaves shadow	" 8th, 1 39 A. M.

The duration of totality, not quite an hour and one-half, is longer than the average, although not a maximum.

The second eclipse of the year occurs on January 22-23, and is a *partial eclipse of the Sun*. It will not be visible in the Western Hemisphere. The regions of visibility are Europe, except the British Islands and Spain, Northern Africa and Western Asia. The greatest obscuration of the Sun is not quite three-quarters of its diameter.

The Earth is in perihelion, that is, at its least distance from the Sun, on January 3, 4 A. M. Pacific Time

*Mercury* is an evening star at the beginning of the year, coming to its greatest east elongation on the evening of January 2. Its distance east of the Sun is then  $19^{\circ} 22'$ , and it remains above the horizon for about an hour and a half after sunset; so that it is in good position for naked-eye observation in the evening twilight. This favorable condition lasts only a few days, as the distance between planet and Sun begins to diminish rapidly, more so than is usual, as the planet passes perihelion about midnight January 11. Conjunction with the Sun comes on the evening of January 18, and thereafter until March 29 the planet is a morning star. It reaches its greatest west elongation on the early morning of February 12 and is then  $26^{\circ} 3'$  west of the Sun, nearly  $7^{\circ}$  farther from the Sun than it was on January 2, but as it is in February  $8^{\circ}$  farther south than the Sun it will rise only a little more than an hour earlier. It may, however, be seen in the morning twilight for a few days about the middle of the month. *Mercury* is in conjunction with *Mars* on January 13, only five days before conjunction with the Sun and on January 30, twelve days after conjunction with the Sun it is in conjunction with *Venus*, but in both cases the planets are too near the Sun for a naked-eye view.

*Venus* is a morning star thruout the period, rising about two hours before sunrise on January 1. This interval gradually diminishes to about half an hour at the end of February; but the great brightness of the planet will allow it to be seen in the morning twilight during a considerable part of the period. The planet is of much less than average brightness, as it is nearing superior conjunction and therefore greatest distance from the Earth. There is a close conjunction with *Uranus* on February 24, but both planets are too near the Sun for naked-eye visibility.

*Mars* is still an evening star, but is being gradually overtaken by the Sun in their common eastward motion, and conjunction is reached on the last day of February. It will hardly be possible to see the planet at any time during the

period, as it sets only about an hour after sunset on January 1, and the interval diminishes to zero by February 28. It is in close conjunction with Uranus on February 2. On February 20 it is in perihelion, or at about the same date as it reaches its maximum distance from the Earth.

*Jupiter* is in fine position for evening observation in the western and southwestern sky. On January 1 it does not set until an hour and one-half after midnight; and altho it is drawing continually closer to the Sun it remains above the horizon until 10 P. M. on February 28. It moves during the period about  $6^{\circ}$  eastward and  $3^{\circ}$  northward from the constellation *Pisces* into *Aries*. No bright stars are near it.

*Saturn* also is in fine position for evening observation, coming to opposition with the Sun on January 17, when it is on the meridian at midnight and remains above the horizon all night. It is on the meridian about  $20^{\circ}$  degrees south of the zenith at 1<sup>h</sup> 20<sup>m</sup> A. M. January 1. Its motion among the stars is retrograde (westward) about  $4^{\circ}$  and  $1^{\circ}$  northward during January and February, from the western part of *Cancer* into the eastern part of *Gemini*. It is nearly on the extension of the line from *Castor* ( $\alpha$  *Geminorum*) to *Pollux*, ( $\beta$  *Geminorum*) not quite twice the distance from the latter that the stars are from each other, crossing this line from left to right during the period. As seen in the telescope the minor axis of the ring is a little more than one-third of the major axis, the rings being distinctly narrower than they were during 1916. There is a close conjunction with the Moon on the evening of February 4, which becomes an occultation for regions south of the equator.

*Uranus* is in the southwestern sky in the early evening during January, rather too close to the Sun for naked-eye observation. On February 8 it comes to conjunction with the Sun, and becomes a morning star, but does not get far enough away from that body for easy observation for several months.

*Neptune* comes to opposition with the Sun on January 23 and is therefore, except for its faintness, in fine position for evening view. It is in the constellation *Cancer*  $8^{\circ}$  east of *Saturn*, and is moving slowly westward.